CORVALLIS REPORT

USDA/ARS
National Clonal Germplasm Repository
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Editor: Kim E. Hummer February 1993

NCGR Personnel

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Dr. Barbara Reed, Plant Physiologist

Dr. Patricia Buckley, Microbiologist
Dr. Henrietta Chambers, *Mentha* Curator
Bill Doerner, Integrated Pest Management
Judith Flynn, Secretary
Ray Gekosky, Ag. Res. Sci. Tech
Jay Goodwin, Seed Management
Lisa Hunt, Screenhouse Manager
Dennis Magnello, Greenhouse, Distribution
Carolyn Paynter, In Vitro Technician
Joseph Postman, Plant Pathologist
Joe Snead, Field Manager
Dr. Margaret Stahler, Geneticist
Dr. Maxine Thompson, Res. Horticulturist
Dennis Vandeveer, Unit Facilities Mgr.

Wes Messinger, Graduate Student
Derek Peacock, Graduate Student
Xiao Ling Yu, Graduate Student
Dennis Yeo, Graduate Student

Dr. Francis J. Lawrence, Collaborator
Dr. Mel Westwood, Collaborator

Staffing Changes
Kim E. Hummer

Over the course of a year our "permanent" staff members have changed quite radically (as usual!). Ms. Donna Gerten, who was our valued database manager, decided to look for a job closer to her Salem home. We have filled her position temporarily with Mr. Brian Courtney, and will be recruiting for a permanent replacement as soon as we can. Lisa Hunt is now in charge of our new acquisitions and the primary collections housed in our screenhouses. Dennis Magnello is in charge of our plant distribution. Dennis Vandeveer has taken on an assignment as unit facility manager.

Dr. Maxine Thompson is continuing to work on *Rubus* taxonomy and cytogenetics and Dr. Henrietta Chambers is finishing up a study concerning *Mentha* and *Pycnanthemum*. Dr. Pat Buckley, our microbiologist, is helping us rid our in vitro collection of internally contaminating bacteria. We appreciate the excellent work that each of these scientists are pursuing for our Repository although their hours are limited.

Dr. Margaret Stahler, who was located at our unit although she worked under the Horticultural Research Crops Unit as Small Fruit Breeder, has taken on a new assignment with the Soil Conservation Service beginning in March. We wish her the best of luck in her new job.

Dr. Chad Finn was hired as the new ARS Small Fruit Breeder-Geneticist. His office will be located with the Horticultural Research Crops Unit in town adjacent to the Oregon State University, rather than at our facility.

Our unit is now supporting several graduate students. Xiao Ling Yu and Dennis Yeo are studying in vitro culture of *Corylus* and *Pyrus* with Dr. Barbara Reed. Wes Messinger is examining sectional differences of *Ribes* taxonomy with Dr. Aaron Liston and me, and Derek Peacock has just begun an assignment with me studying *Rubus* genetics and seed germination.

While a number of our staff members have changed over the years, four of us have worked at the Repository since the early or mid-1980's. While we develop ever improved techniques for storing germplasm and information we keep in mind how we started and are amazed at the development in the collections and our information management system.

New Accessions and Inventory
Kim E. Hummer

One sweeping change that has occurred at the Repository has involved our local or inventory numbering system. We have decided to adopt a system that keeps track of seedlings from a seedlot using increasing decimals from the base seedlot number. While this seems like a small change on the surface - and an important one needed to keep track of clonal observations on our seedlings - this is a major change to our database which used our local number as a primary identifier. We are now making changes so that our observation records at home and on the GRIN system will be accommodated. We are in the process of updating our GRIN accession, inventory, observation, cooperator, and order processing data and hope that we can have all of these records as up to date as possible by the end of February.

We are continuing to increase our collections. We have added 749 new accession records to our file including more than 1067 new inventory items. Our largest increases were *Rubus* and *Fragaria*. Several USDA plant exploration trips provided us with new species of *Rubus* from Chile, Ecuador, China, and Russia. The return of Scott Cameron to Chile provided us with additional collections of *Fragaria chiloensis*.

Corylus scionwood was received from Russia to replace material that did not survive propagation last year. We gratefully acknowledge Dr. L. Burmistrov of Russia, Dr. L.N. Lasareshuili of Tbilisi and Dr. George White of the United States for facilitating this germplasm exchange. We also thank Sophia Golotareva and Natasha Scribanova for sending *Corylus* seeds from Russia.

We have also received new *Corylus* from Manuel Coque-Fuertes and Merce Rovira in Spain. Wes Messinger has added six species native to the Pacific Northwest to our *Ribes* collection. Dr. Tom Lumpkin obtained several species from Sachalin Island, Russia for us.

We have been corresponding with Tom Brown who obtained Pears from La Purisima Mission in California for our collection. We also received two shipments of Italian pears some of which are very early ripening. These are now being processed through our National Plant Germplasm Quarantine Center in Beltsville, MD. Our thanks go to Professor Aggabio of Sassari and Professor Belini of Florence for sending us this scionwood.

The main activity in our Vaccinium collection has been with cranberries. We have received accessions of native collections from the southern range of *V. macrocarpon* collected by Jeannie Allen. In addition, Dr. Stang has provided cranberry selections and cultivars from Wisconsin and propagules of *V. vitis-idaea*, the lingonberry. Several clones of *Sorbus*, said to be bred by Luther Burbank, have been added to our collections.

We have recently assumed responsibility for the species, *Juglans cinerea*, the buttemuts, at the request of the Davis Repository. Davis could not house this germplasm because of California quarantine regulations. We have 18 selections of Buttemut now planted at our new farm. The Paw-paw, *Assimina triloba*, is a native American fruit which had not previously been assigned to a repository. We will be assuming responsibility for this species with new crop potential. This tree has an edible fruit and is native to the Southeastern United States. We will participate with Anita Azerenko of the OSU Horticulture Department and Neil Peterson of the National Paw-Paw foundation on a cooperative project evaluating Paw-Paws in 14 states throughout the country.

We appreciate the fine cooperation from all of our collaborators around the world and we look forward to continued interaction for mutual benefit in crop improvement.

Mint Collection
Henrietta Chambers

The Repository has obtained many new mint accessions recently including *Mentha australis* from Victoria, Australia, *M. diemenica* from New South Wales, Australia, *M. cunninghamii* from New Zealand, *M. lopetdaghensis* from Turkmenia, *M. haplocalyx* from China, and 14 plants, not yet identified, from Thomas Lumpkin from Sahkalin Island and the vicinity of Vladivostok. We really appreciate the efforts of all the collectors who have sent us this plant material. The Australian and New Zealand species arrived early enough

in the season to obtain flowers, buds and chromosome counts of those collections.

I have examined and annotated approximately 800 herbarium specimens of the native Australian and New Zealand species from the major herbaria in these countries. Maps will be marked with the recent collections that provide good locality data and will be assembled in readiness for USDA scientists travelling there to collect plants. An unexpected "bonus" of this effort was obtaining some mature, viable seeds from the herbarium specimens. Jay Goodwin was able to germinate some and we added to our collection: *M. australis* from New South Wales, Australia, and two accessions of *M. diemenica* var. *serpyllifolia* from Victoria, Australia. The chromosome project is now being written for publication.

Related Genera as Pear Rootstocks, Preliminary Results
Joseph Postman

Quince (*Cydonia oblonga*) is often used as a dwarfing rootstock for pear, but has disadvantages such as susceptibility to fireblight, lack of cold hardiness, and incompatibility with some pear cultivars. Three virus free pear cultivars, which differ in their known compatibility with quince, are being used in what we hope will be an ongoing screen of various *Maloideae* genera for their potential usefulness as pear rootstocks. After the first growing season, graft survival was nearly 100% (5-10 trees per cultivar per rootstock) on seedlings of *Malus domestica*, *Amelanchier alnifolia*, and *Sorbus aucuparia*, and on *Pyronia veitchii* interstocks. Extension growth of 'Bartlett' and 'Bosc' was greater on *Sorbus* than on pear rootstocks. 'Bartlett' grew only half as long on *Amelanchier* as on pear rootstock. Growth of 'Passe Crassane', which is naturally semidwarf due to it's short internodes, did not differ on any of the rootstocks. Rootstocks ready to be grafted this year include 2 species each of *Amelanchier* and *Sorbus*, 1 species each of *Crataegus*, *Cotoneaster*, *Docynia*, and *Peraphyllum*, and interstocks of *Mespilus* and *Sorbopyrus* (on pear roots).

Winter Chilling
Bill Doerner and Nancy Higgins

Plants adapted to growing in temperate zones are able to survive winter by entering an inactive state known as "dormancy." When buds are dormant, internal physiological blocks prevent growth even if temperature and soil water conditions are favorable for growth. This is what horticulturists refer to as "rest." In order for growth to resume, the rest period must be terminated. Exposure to cold temperatures or "chilling" accomplishes this. The amount of chilling required to break rest varies among different plants. According to Westwood (1978) in Temperate Zone Pomology some of the crops at the Repository require the following range of hours of chilling units to break winter rest. Strawberry 200-300, Blackberry 300-700, Blueberry 700-1200, Currants & Gooseberries 800-1600, Pear 700-1600, Hazelnut 800-1700, Raspberry 800-1700, Northern Paw Paw 1000-1700.

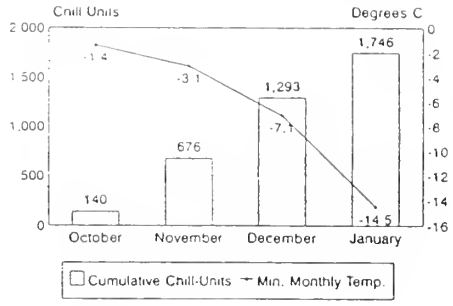
A mathematical model for estimating the completion of rest was developed by researchers at Utah State University during the 1970's. This model is based on the accumulation of "chill-units" where 1 chill-unit equals 1 hour of exposure at 6°C (43°F). Chill-unit values become less than 1 as temperatures rise or drop below this optimum value. Negative chill-unit values are reported when temperatures rise above 15°C (60°F) and 0 values are reported when temperatures fall below 0°C (32°F).

We are using this model to convert hourly temperatures recorded in our pear orchard to chill-units and reporting the chill-unit accumulation for a 24 hour period. From Oct. 1 to March 1 we are calculating the chill-unit accumulations in an effort to better determine when rest has been satisfied. Most fruit and nut species chilling requirements were satisfied by January 31. A summary of the chilling units accumulated in our Pear Orchard, Corvallis, OR. since October 1, 1992 is given in Fig. 1.

Please note that our lowest recorded winter air temperature of -14°C on 10 January 1993 was colder than that recorded at the Lewis Brown Horticulture Farm (-13°C) or that at the Hyslop Farm (-12°C).

FIG. 1

WINTER CHILLING 92-93
NCGR- Corvallis, OR



The State of the Screenhouses
Lisa Hunt

I have been recently hired to oversee the screenhouse, shadetube and post-entry quarantine collections. I also handle new plant acquisitions as they arrive.

A database has been created to enable us to keep better track of quarantine plant material, streamline plant inspections, and provide more information on the pot labels. We are in the process of attaching new plastic labels to each of our plants in quarantine.

We are currently collecting hardwood cuttings of *Vaccinium* to repropagate older screenhouse plants. The cuttings will be stored (calloused) at 0°C until late spring, then treated with rooting hormones and placed in the mist bed. Cuttings from the screenhouse plants have not propagated easily in the past and the stock plants have micronutrient deficiencies. The collection was given micronutrient last summer and color and vigor improved. We are hoping that with the improved vigor we will have more success in rooting cuttings this year. In the future, the *Vaccinium* collection will be given a slow release fertilizer containing chelated iron as well as supplemental liquid fertilizer applications of a formulation suited to acid-loving plants.

Seed News
Jay Goodwin

Almost 2300 of our accessions are represented by seed, with 1900 of these seedlots representing major genera and 400 being seed of minor genera.

Our seed is stored at -20°C. Stored seed is packaged in a special envelope made of paper, aluminum foil, and plastic all laminated together. These envelopes are intended to be impermeable to moisture, both liquid and gaseous, but they are not. Since our freezers are subject to frost build-up, I ran an experiment to investigate moisture transfer to stored seeds. I dried fresh *Vaccinium* berries, weighed them, packaged them in the same way as our stored seed, and put them in the freezer. If the dried berries were able to absorb moisture during storage, they would get heavier. I ran the experiment for seven months, checking the weight of the stored berries. The weight of the dried berries did not significantly change within seven months. I believe that our present procedures are probably suitable for 10-15 years of storage. We plan to regenerate seed after 10-15 years in storage to insure high viability.

I have also completed an initial experiment investigating germination of *Ribes* seed. I found that *Ribes* seed should be extracted from the fruit and stratified at 5°C for 8-12 weeks to break dormancy. The seeds can then be germinated under fluctuating temperatures (such as 10/25°C). We are investigating macerating enzymes for degrading seed coats and promoting germination in hard-to-germinate species. These enzymes offer an alternative to the acids presently used in seed scarification.

Germination Hint: If you have the patience, 12 weeks of stratification at 5°C will promote a good germination response in many of our hard to germinate seeds.

Integrated Pest Management
Bill Doerner

The objectives of the Integrated Pest Management (IPM) program include:

1. Maintain healthy and vigorous plants.
2. Prevent germplasm loss due to pests.
3. Limit the spread of disease and viruses.
4. Provide safe, effective, ecologically acceptable pest management.

In our field collections, we rely primarily on natural control factors (i.e. control measures which occur without the intervention of humans) to meet these objectives. Pesticides are applied when necessary to manage pests within an acceptable level. Most insecticide and fungicide applications on field material are dormant oil sprays. These consist of copper or lime sulfur mixed with a dormant oil. In some cases Bordeaux (copper sulfate + hydrated lime) sprays are used. Dormant oil sprays are applied during the fall and winter seasons when the plants and natural enemies are dormant or semi-dormant. Fungicidal sprays are applied during March and April to control scab on pears. By carefully monitoring our field collections, we have found this approach to be effective in meeting the IPM objectives.

We continue to experiment with mating disruption or "male confusion technique" as a control strategy for codling moth in our pear orchard. Several factors unique to our situation at the repository have limited the success of this tool thus far. However, more research is needed to better understand this promising new technology and it's potential in our IPM program.

This last season was an exceptionally bad year for codling moth in the Willamette Valley. This was probably due in part to the mild open winter we experienced last year. If we're lucky, this colder winter we are having should reduce the overwintering codling moth populations for the 1993 season.

Plant Distribution
Dennis Magnello and Kim Hummer

One of the functions of the NCGR is the exchange of plant germplasm for research, on an international level. In 1992, the NCGR-Corvallis distributed a total of 2,634 items, as seeds, cuttings, runners, scionwood, rooted plants and tissue culture, to researchers in the United States and abroad.

Evaluations returned to the Repository indicated that 90% of the plant material arrived in good condition. However, despite careful packaging and attention to d

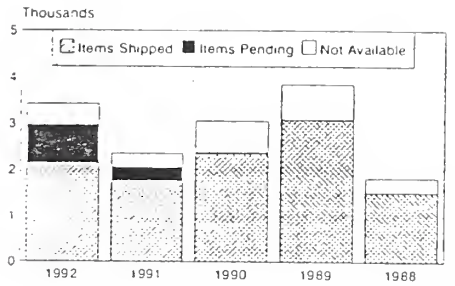
most expedient methods of shipping, some plants died in transit or arrived in unsatisfactory condition.

Foreign shipments of plant materials may present additional obstacles, particularly in countries where transportation systems are not highly evolved. In some instances, packages sent airmail from the United States have taken four to five weeks to arrive at their final destination, with subsequently spoiled contents.

Over the last five years we have received 3,000 to 4,000 requests and shipped 2,000 to 3,000 plants each year (Fig. 2). Some requests may be "pending" for up to three years because of foreign import permit coordination and seasonal or slow-growing plants. As many as 500 items per year were requested that were not in the repository collection or were not yet large enough to propagate. Foreign distribution accounted for 26% of the items shipped in 1992.

FIG. 2

PLANT REQUESTS



Corvallis Database, January 1993

Vaccinium and Fragaria Evaluations
Margaret Mary Stahler

This last fruiting season we were able to do a fair amount of evaluation work. We worked on *Fragaria* and *Vaccinium* flower, fruit, and plant structure observations. This work was carried out by the field crew who welcomed the change from the normal field functions.

The information is available here at the repository and will be available through the GRIN system.

NCGR Events
Judith Flynn

Unquestionably the exchange of information globally for the Repository is a great experience for the personnel. Maxine Thompson, Horticulturist, spent one month in Guizhou Provence, China on a plant exploration trip. Recently Maxine has completed an in-depth trip report discussing the plant material that the exploration team obtained. Dr. He, Director of the Nanjang Botanical Gardens has visited the Repository in October 1992. Barbara Reed was the guest of the Criobiology Congress and First General Assembly of the Spanish Interdisciplinary Society of Criobiology to speak at their meeting in Oviedo, Spain. Kim Hummer presented a paper as the guest of the Fruit Germplasm Symposium, Sardinia, Italy

The most important highlights for the Repository were the International Safe movement of Small Fruits Meetings and the *Ribes* Importation - Risk Assessment Workshop, *Ribes* - Reversion - Eriophyid Mites - Viruses. The Safe Importation meeting was held August 13-15, 1992 just before the Ribes Risk Assessment Workshop, August 17-18, 1992. The first gathering consisted of people from USDA-ARS, FAO, USDA-APHIS, and international government importation agencies. Dr. Emile Frison, IBPGR in Rome, Italy is compiling the publication from the meeting. The second meeting was sponsored by: USDA-ARS, USDA-APHIS and OSU Department of Horticulture and held in Corvallis, Oregon. Dr. Kim Hummer was the convener of the meetings and editor of the proceedings.

The Repository has hosted many visitors during the past year. Nine classes from elementary age through college visited bringing approximately 175 students to tour our facilities at their level of expertise. People travelled to the Repository from foreign countries such as Costa Rica, Ethiopia, Bhutan, Poland, Hungry, China and Chile. Dr. Rekha Chaudhury of India was on the U.S. Agency for International Development program and spent one month of study in Dr. Reed's in vitro lab. She was a delightful guest and was befriended by the whole staff. Roberto Botto of Italy was another scientist visiting the Corvallis Repository and Oregon State University for six months. His exchanges with the staff were enlightening.

Garry Temple, Scio High School Agriculture teacher, spent three weeks learning in vitro culture techniques for use in his classroom.

Many people from industry, nurseries, packing plants, private research companies, farmers, neighbors and those vacationing in Corvallis stopped in at the Repository during 1992.

This past year we were delighted to visit with several of our retired cooperators: Drs. Sam Dietz, Royce Bringhurst and Dick Converse.

New *Ribes* Field Planted
Ray Gekosky

We have planted a new *Ribes* field on our 40 acre farm which has species and seedling collections and a separate varietal collection. Each consists of approximately one acre of land. Rows are 4' wide with 8' of turf in between and plants are spaced at a 4' separation. Two of each species or cultivar are planted when available except for seedlings (plants generated from seed) which have one of each. The new plants survived the hot dry summer with minimal losses. We irrigated often with an overhead system which also helped to establish our turf rows and turf trials. In the future we hope to add drip irrigation to this field.

In cooperation with Ray Williams of Oregon State University, we have established a number of different turfgrass varieties within the *Ribes* field. These new varieties include fescue, ryegrass, and bluegrass types with such names as: Silverado (Tall Fescue); Aurora (Hard Fescue); Shademaster (Red Creeping Fescue); Bighorn (Sheep Fescue); Navajo (Perennial Ryegrass); Midnight (Kentucky Bluegrass); and Common (Annual Bluegrass).

New *Rubus* Field
Ray Gekosky

We have planted a *Rubus* species field on our North farm. At present only a few rows have been planted. Vegetatively propagated *Rubus* species will also be included in this field. Eventually we hope to move the species from our original field collection to the new field and maintain the original as a varietal collection. Plants at the present are at a 4' separation with a 8' separation between different seed lots. Poles have been installed for trellising. We will be using a 2 wire system, one at 2' and one at 4'width. Overhead irrigation will be used.

The original *Rubus* field has expanded beyond our drip irrigation system so we will be installing new drip line before summer. More rows will need trellising wire installed but the poles are already in place. We have gone to alternate year production with the accessions that have 2 plants planted. Each year one of the plants will be cut back to the ground while the other is allowed to fruit. This will give us the fruit every year while cutting back on cultural maintenance labor.

Lisa Wakefield
Joe Snead

For a year now we have employed Lisa Wakefield through Work Unlimited, a local organization that helps employ the developmentally disabled. Lisa has a severe case of autism and has been in an institution most of her life. Because of the severity of her condition she needs help to achieve the employment goals. Working with Work Unlimited and Lisa has made for an interesting and rewarding year for us all.

Work Unlimited provides trainers for Lisa during her work day making it possible for her to do a variety of tasks for us in our greenhouses and field operations. These tasks include; pot washing, fertilizing potted plants, spot fertilizing field plants, thinning fruit, weeding, moss removal from screenhouse pots and runner and flower removal from our strawberry plants. During these times she has direct contact and interaction with the staff. Like all of us she likes some assignments more than others. We try to be sensitive to her needs.

In addition to the work tasks that Lisa performs there is the social interaction that takes place. Lisa joins us at our morning coffee break. At first I thought that we might be too loud for her because we laugh and joke a lot. We were assured that she enjoyed this. We have found that she has a good sense of humor. We also found out that she enjoys baked goods as much as the rest of us. She has become a part of the crew. The social interaction has been good for Lisa. Just as important is what we have gained from having Lisa with us. I think that each of us have grown from our interactions with Lisa. We look forward to the continuation of this relationship and the help that she provides.

North Farm '92
Joe Snead

The appearance of the farm has changed quite a lot in the last year. The old green house was moved from the property and now is about 20 miles away just outside historic Brownsville, OR. It was the last structure on the property. We rented a bulldozer for a day and a half and removed the old foundations of the house and barns. We still have some debris removal to do but the clean up is finally coming to an end. Since there is not an office or personnel there all the time the gate is locked unless someone is there. Plans are in the works for a new storage building to be erected on the site.

The second stage of the fencing was completed around the property. We now have deer fencing around most of the property. Along the road chainlink fence was installed. The front gate is set back far enough to allow trucks or buses to get all the way off the road before entering.

The irrigation system has been completed and went into operation this spring. Underground electrical service was installed to the third well. The third well had a pump and control panel installed and was connected into the irrigation system.

We have planted a butternut collection in a single row that runs the entire length of the highway frontage inside the fence. Several more rows could be planted if

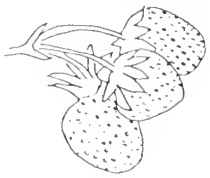
needed. The planting should make an attractive entrance to the farm.

A hops field will be planted this spring. The hop trellis was installed this fall and the plant positions marked for planting. Dr. Alfred Haunold, Research Geneticist, USDA-ARS is the curator of our hops collection and in charge of the hops breeding program. About three acres will be turned over to this program for establishment of a *Humulus* germplasm collection. This program has paid for the installation of the trellising, the third well pump installation, and additional hydrants. They will do all the farming themselves but certain aspects will be done in cooperation with our farm crew. Pesticide and irrigation records will be maintained and provided to us so that farm records can be maintained as a whole. This situation should work to the advantage of both programs.

The next planned planting will be the establishment of a nursery for short term growing and experimenting. This will be in an area close to the road and front gate.

Wild Patriotic Strawberries?

Kim Hummer



Strawberries are native to the North American Continent. This fruit may be native or may have naturalized in every state of the union (yes, we already have strawberries from Alaska and Hawaii). We do not have strawberries from the following states: AL, AZ, AR, CT, DE, DC, GA, IL, IN, KS, ME, MO, NE, NJ, ND, OH, OK, PR, RI, SC, TN, TX, VA, WV, WI.

We would appreciate receiving wild strawberry runners or crowns from any of the above states to expand our "Patriotic" Strawberry Collection. We will be on the lookout for sources or localities and appreciate any suggestions that our cooperators may have.

New Info on Ribes Vein Banding

Joseph Postman

The following is from a "disease note" that has been submitted to Plant Disease.

Vein banding disease of currants and gooseberries (*Ribes sp.*) is presumed to occur wherever these crops are grown , however, vein banding has never been officially reported in North America. The causal agent is presumed to be viral based on symptoms, graft transmissibility and aphid transmissibility. The vein banding diseases of black currants, red currants, and gooseberries are treated independently in the literature, and may be caused by more than one virus. The repository's *Ribes* germplasm has been assembled from research stations, private contributions, and collecting expeditions around the world, and vein banding has been the most common virus-like disease found in this crop. Unlike other virus diseases at the Repository, which must be detected by special tests, vein banding can be diagnosed by direct observation of the potted clones growing in our screenhouses or greenhouses. Leaf symptoms of vein banding are distinctive and are unlikely to be confused with any other disorder except aphid toxicity. No aphids have been present on these plants! U.S. sources of infected plants include California, Connecticut, Minnesota, New Jersey, New York, Oregon, Rhode Island, and Washington. Symptomatic plants have also been received from Canada, China, Czechoslovakia, England, Germany, The Netherlands, Pakistan, Sweden, and Uzbekistan. The NCGR collection has 630 clonal *Ribes* accessions, 17.5% of which have vein banding disease. Symptoms have been noted in 16% of 286 gooseberry, 48% of 84 red and pink currant, 52% of 31 white currant and 5% of 92 black currant clones. Naturally infected plants represent the species *Ribes aureum, R. diacantha, R. grossularia, R. lacustre, R. maximowiczii, R. nigrum, R. orientale, R. pauciflorum, R. petraeum, R. rubrum, R. sanguineum*, and *R. uva-crispa*. This represents the first report of this disease in North America, and an extension of the natural host range.

Incidence of Blueberry Scorch Carlavirus in Vaccinium Germplasm

Joseph Postman

The blueberry scorch disease which is caused by a virus in the Carlavirus group has been slowly spreading in the Pacific Northwest. Our Vaccinium germplasm collection was tested for this virus by ELISA using antiserum kindly provided by Dr. Robert Martin of Agriculture Canada, Vancouver, BC. Only 5 accessions were found to be infected out of 325 tested. All infected clones originated from a single source in Puyallup, Washington. These plants have been removed from our collections.

Tissue Culture

Barbara M. Reed and Carolyn L. Paynter

We have finished screening cultures of 49 *Pyrus* and one *Pyronia* accession for in vitro rooting. Root production by $\geq$ 50% of the shoots tested was considered the minimal acceptable level. Auxin treatment (IBA or NAA) was required for rooting in most cases. Eighteen of the 50 accessions rooted with a 15 sec. IBA dip followed by growth on medium with no growth regulators (NGR). Medium with ten μM IBA for one week followed by NGR medium was good for 12 accessions ($\geq$ 50%), while NGR medium alone produced little or no rooting (2 $\geq$ 50%). Ten accessions failed to root on these treatments. For 29 accessions which rooted poorly on the first three treatments, root production was increased 10% over the IBA dip treatment with a 15 sec. dip in 10 mM NAA followed by NGR medium but the difference was not significant for all genotypes. Root production was best on the NAA dip treatment for 8 of 18 especially recalcitrant genotypes but 10 did not respond to any of the treatments.

Evaluation of our cold-storage procedures is continuing with several genera. Cold- stored *Rubus* accessions were evaluated in tissue-culture bags and 20 x 150 mm glass tubes under three environmental conditions. Cultures stored at 10°C in the dark were in poor condition after six months and were removed for repropagation. Condition and survival ratings were better for bags than tubes at 4°C and a 12-h photoperiod greatly improved both the survival and condition for many genotypes. A survey of the 250 accession germplasm collection at 4°C (dark) found 92% of accessions in bags and 85% of accessions in tubes in suitable condition to remain in storage. Storage in the growth room (25°C) on reduced-nitrogen medium is an alternative method for cold-sensitive genotypes.

Graduate student Xiao Ling Yu has improved media formulations for the collection and developed micropropagation systems for two non-suckering hazelnut-rootstock selections and the newly-released filbert-blight resistant 'Willamette'. She hopes to finish her Ph.D. by the end of the summer. Graduate student Dennis Yeo is perfecting systems for pear rootstock micropropagation for his M.S. thesis. Ms. Piyarak Tanprasert will begin a masters provost in April.

Visits To Other Tissue Culture Facilities

Carolyn Paynter

During August of 1992, Barbara Reed, Xiao Ling Yu, and Carolyn Paynter traveled to Hawaii to visit tissue culture laboratories on the big island of Hawaii and to attend the annual meetings of the American Society of Horticultural Scientists in Honolulu. Of particular interest was our visit to the Germplasm Repository at Hilo. As in all the laboratories we visited, contamination was a constant problem, since under tropical conditions of heat and humidity, unwanted microorganisms flourish. At the Hilo Repository we also discussed some of the difficulties of working with a broad range of genetic material from a variety of genera. Field growing conditions at our sister Repository are quite different from those encountered in Corvallis. In Hawaii, preparing a field for planting involves bulldozing tons of lava rock off to one side of the field and then using a back-hoe to gouge out a planting hole in the lava for the field grown accessions.

During a visit to a laboratory working with banana tissue culture, we noted that they were using new low energy electronic ballasts for their fluorescent lighting system. Since our return to Corvallis, we have investigated converting from the normal solid core ballasts to the more energy efficient electronic ballasts. It was discovered that the power supply in the Corvallis area fluctuates a great deal, leading to premature burn-out of the electronic ballasts, which are high in initial cost, so we decided to keep on using the normal solid core ballasts.

We visited several other laboratories and observed various solutions to the problems of setting up tissue culture propagation facilities under conditions of high contamination rates. We visited a wide range of tissue culture laboratories, from large commercial orchid and banana operations to smaller labs set up by one person.

At the ASHS meetings in Honolulu, we were able to attend many poster sessions and seminars of interest. We made contact with a researcher who has developed a tool for easy opening of our tissue culture vessels. We also discussed sources of supply with researchers working with a plant growth hormone of interest in a future research project. Besides information on tissue culture, we heard speakers concerned with the conservation of germplasm for the future. Generally, the emphasis of the meetings was toward tropical plants, but much of the information presented had broad applications.

In vitro Contaminants

Pat Buckley

We have developed procedures which enable us to rapidly detect bacterial contamination in our in vitro cultures. For the first, we initiate shoots in tubes of liquid medium and observe them for turbidity due to bacterial growth. For the second, we inoculate cut stems on plates of enriched soft agar medium and observe them for visible colonies of bacteria. In both cases, results can be determined within one to six days of incubation under growth room conditions at 26-30°C. We are able to detect most contamination quickly using these methods.

In vitro mint cultures have been tested for internal bacterial contamination. Thirty-nine cultures tested positive for bacteria and were treated with antibiotics, multiplied, retested and then cold-stored for 12 months or longer. We treat cultures that have persistent continuing infections with antibiotics. We chose streptomycin, gentamicin, neomycin and rifampicin after we observed that most of the contaminants were Gram-negative bacteria. Maximum concentrations in μg/ml were streptomycin, 1000; gentamicin, 50; neomycin, 500; rifampicin, 50. When 25 of the treated cultures were taken from cold storage and regrown, 19 (76%) tested negative for bacteria.

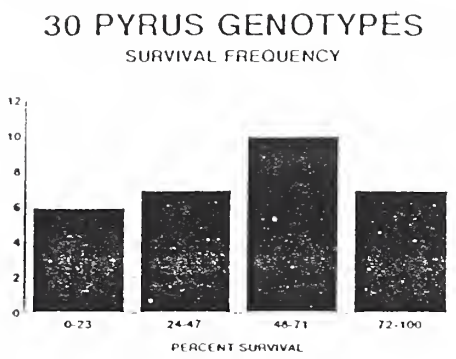
Our remaining goals are to complete the identification of the bacteria which were endophytic contaminants in our mint in vitro cultures, and to outline procedures for selection and effective use of antibiotic therapies in the micropropagation laboratory.

Cryopreservation
Barbara M. Reed

When we look for success in plant germplasm cryopreservation, genotype must certainly be taken into account. Such factors as growth habit and general morphology of a plant may affect its' cold tolerance or the ease of dissection. Development of methods can only be done with a few genotypes at a time, however it is important to know how a diverse germplasm collection will respond if storage is a goal.

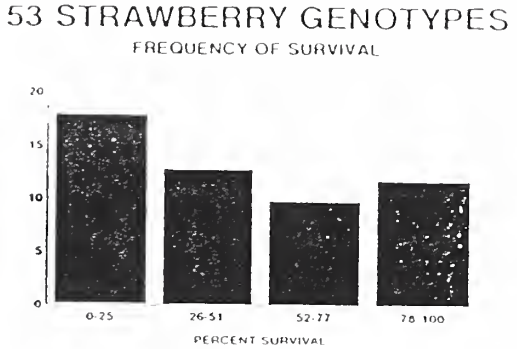
We screened 30 *Pyrus* genotypes using the technique developed earlier for four genotypes. The distribution of survival rates is shown in Figure 3. About 60% of these genotypes have survival rates high enough for storage (> 50%).

FIG. 3



A screen of 53 *Fragaria* genotypes shows a very different distribution of genotypes (Figure 4). About 40 % of these genotypes would be suitable for storage. The differences between these two genera and among the genotypes illustrate some of the difficulties we are facing in germplasm storage.

FIG. 4



To overcome some of these recalcitrant genotypes, we are employing new methods such as vitrification (solutions which form a glass at low temperatures rather than crystals) and alginate-bead encapsulation. These techniques provide alternatives for those genotypes which do not respond to the standard procedure. The availability of several methods will improve the success rates for some genotypes.

New Virus Discovered
in Strawberry Germplasm from Chile
Joseph Postman

Recent plant collecting expeditions to Chile have resulted in several hundred new strawberry plant and seed accessions. We found several of these accessions to be infected with an apparently new virus. Sara Spiegel of the Volcani Center in Bet-Dagan Isreal working with Bob Martin at Agriculture Canada, Vancouver, BC, have determined that this is a new member of the *ilarvirus* group, and have proposed the name *fragaria chiloensis ilarvirus* (FCIV). Antiserum prepared against the virus has allowed Spiegel to test all of our Chilean accessions by ELISA, and she has found several additional infected plants as well as seven infected seedlots. All infected plants are symptomless. We germinated seeds from infected seedlots, and discovered that roughly half of the resulting seedlings were also infected with FCIV. Seed transmission of viruses is very rare in strawberry, especially at such high levels. Persons who have received infected seed samples are being contacted and asked to either destroy the material, or send it back for testing.

1993 Catalogs

An updated catalog of available *Pyrus* accessions has been prepared, and listings for our other genera will be ready soon. Please specify genera of interest when requesting a catalog.

Visiting Scientists

Several visiting scientists will be studying at the Repository this coming spring and summer. Dr. Gunther Staudt, German Plant Taxonomist, is planning to visit in May and June 1993 to study the recently collected Chilean strawberries. Dr. Staudt has studied strawberry species throughout the world and named several taxa. Several scientists from NBPGR, New Dehli, India will be making short visits and others more extended study. Dr. S.K. Verma will spend several weeks at our laboratory at the end of July to study Small Fruits. Dr. (Mrs.) R. Pandey and Dr. (Mrs.) N. Sharma will study in vitro culture at our facility during September

Curator's Corner: State of the Repository
Kim Hummer

Gene banks or repositories seem to develop in growth spurts like the plants that they house. The germ of the idea to establish the US Clonal Repository System was sown by Brooks and Barton in the 1960's. The starter seeds of these repositories unfortunately must have had hard seed coats because it took 20 years of pregermination treatment before congress appropriated funds to establish and dedicate these facilities. The young clonal repository sprouts now find themselves to be 10 to 12 years old, watered by minimally sufficient base funding, and nourished by a reasonable amount of federal administrative fertilizer.

We clonal repositories should now be experiencing the normal exponential phase of the standard sigmoid growth curve. Instead we find that our development is leveling because of fiscal limitations. We realize that our place in the system of foreign importation and domestic establishment of fruit and nut crops is critical. We are working with those in the system to improve quarantine and plant introduction. We provide an international service by making raw materials available for development and improvement of economically important food and fiber crops. Our collections contain a potential pharmacy of the future. Wild blueberries may contain compounds that improve human vision. Strawberries and blackcurrants may contain anti-cancer substances. Who knows what future medicines lurk beneath the bark, seedcoats or fruits in our collections. We provide a long term conservation effort for some endangered plant species or individual and vulnerable genotypes.

With this large assignment we want to expand our operation but are limited in our adolescence, not by ideas or enthusiasm, but by funding. Our present outlook is grim. In 1990, the Corvallis Repository supported 17 full time equivalent (FTE) staff in federal positions. Since our base funding has not kept up with inflationary costs, we have 15 federal FTE in 1993 and project that we can support 13 federal FTE in 1995. Since 1990, our state employees have remained at about 2 FTE thanks to a research support agreement with Oregon State University which covers Graduate Research Assistants and undergraduate student hourly wages. Although the staff is diminishing, the Corvallis Repository collections should continue to increase by about 1000 accessions per year for the next several years, to accumulate vulnerable germplasm diversity of assigned genera. Such is the continued germplasm challenge, unchanged since Vavilov's time : conservation is imperative regardless of support.

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